MiFID II unbundling and sell side analyst research

Abstract

We examine the effect of MiFID II, which mandated the unbundling and separate pricing of analyst research in Europe beginning in 2018. We find that the requirements of MiFID II were associated with a reduction in analyst following for European firms relative to US firms, with decreases in coverage greatest for firms that were larger, older and less volatile, and had greater coverage and more accurate consensus forecasts. Remaining analysts follow fewer firms and issue fewer forecasts, consistent with increased focus, and appear to increase their efforts on the firms they continue to cover. In particular, forecasts become more accurate, are more likely to be disaggregated and include recommendations, and are accompanied by larger stock price reactions. Consistent with increased effort to curry favor with management, analysts issue more optimistic recommendations and beatable earnings forecasts. While individual forecasts are more informative, the overall information environment for the average firm tends to deteriorate, with less aggregate information conveyed by analyst forecasts, a greater proportion of information delayed to earnings announcements and higher average bid-ask spreads. Taken as a whole, results are consistent with a reduction in analyst following mitigated by an increase in focus and effort by remaining analysts, but with an overall negative effect on the information environment.

JEL Classifications: G14, G18, G24, G29, M41, N44

Keywords: *Sponsored Research, MiFID II, Analyst Coverage.*

1. Introduction

The Markets in Financial Instruments Directive (MiFID) II, which came into effect on January 3, 2018, is a legislative framework instituted by the European Union (EU) to regulate financial markets and improve investor protection. It was intended to standardize practices across Europe and increase transparency to restore confidence in financial markets after the 2008 financial crisis.

A major component of MiFID II is the requirement that brokerages and banks unbundle payments for research relative to trading costs. The goal is to increase transparency and flexibility in payments for research. Prior to MiFID II, there was concern that brokers were bundling research with trading costs ("soft dollars") to induce investment funds to steer trading to the brokerage. In addition, because the research costs were bundled, they were "hidden" in trading costs reported by investment funds. Hence, investors could not scrutinize the discretionary component of expenses associated with research. MiFID II requires that trading costs be separated from research costs, creating flexibility for investment funds to choose whether to purchase research (and how much), as well as increasing the visibility and potential scrutiny over research payments by investors to better assist in managing investment expenses.

Commentators have noted that MiFID II constituted, "one of the largest global regulatory packages in the past ten years" (Hopfensperger, 2018) and that it has been "dominating the thoughts of financial professionals across Europe and beyond." (Exane BNP Paribas, 2017). In particular, implementation of MiFID II could significantly change incentives for sell side analysts at banks and brokerages providing execution and research to investment funds. (Bloomberg, 2019) Additional scrutiny increases pressure on brokerages and fund managers to justify research costs given the new level of transparency. As a result, MiFID II has potential implications for the

number of analysts that follow firms, their allocation of effort, the overall quality of research and, ultimately, the information environment for firms.

In this paper, we provide some of the first broad-scale evidence on the effects of Europe's adoption of MiFID II on sell side analyst research. Our primary empirical analysis uses a difference-in-differences design to compare analyst activity in Europe to that of the US over the period from 2015 through 2018. Analyst activity in the US was quite stable over that period and provides a plausible counterfactual because the US faced similar economic forces (and controls can be included to mitigate remaining differences), but was not subject to MiFID II. Data from 2015 through 2017 constitute the "pre" period and should be relatively unaffected by MiFID II.[1] Data from 2018 constitute the "post" period after MiFID II was implemented.

We provide evidence on five related questions. First, did MiFID II reduce overall sell side analyst coverage? To the extent that the cost of research became more salient to investment funds and investors, commentators have speculated that it would reduce overall demand for analyst research. (Bloomberg, 2019) Our results suggest an economically and statistically significant overall decrease in analyst coverage for the EU firms relative to US firms of about 10%. Limiting the sample to firms that had positive coverage prior to MiFID II, the decrease was approximately 15%.

Second, what types of firms lost analyst coverage? To the extent that MiFID II increased scrutiny of research payments, the effect was likely to have been largest for firms for which it was more difficult for the marginal analyst to justify their incremental contribution (e.g., larger firms with higher analyst following, and older and less volatile firms for which consensus forecast

[1] One potential issue is that brokerages may have started taking action (e.g., redeploying analysts) once the requirements became clear in 2017 in anticipation of the effective date of MiFID II in January 2018. Indeed, we find evidence of an anticipatory response in the 4th quarter of 2017, the quarter before MiFID II formally took effect.

accuracy was already high). Our results are consistent with predictions in that the loss of coverage was concentrated in medium and large firms, with no evidence of a reduction for small firms. Controlling for size, the effect was largest for firms with greater analyst coverage, older firms, firms with less volatile returns and firms for which consensus forecasts were more accurate.

Third, how do remaining analysts change their production function after MiFID II? To the extent that visibility and scrutiny are greater once research costs are unbundled, we expect analysts to focus their activity on a smaller number of stocks where they can add the most value. In addition, we expect analysts to work harder on the remaining stocks they follow and spend more time processing information. To increase their perceived value, we expect forecasts to be more comprehensive (e.g., include more line items and stock recommendations), and recommendations to be revised more frequently with fewer "hold" recommendations.

Consistent with analysts narrowing their focus after MiFID II, the number of firms covered by an individual analyst drops. Analysts appear to increase effort in developing their forecasts on the remaining firms they follow in that they provide more accurate forecasts, with a greater number of disaggregated line items forecasted and a longer lag between the previous earnings announcement (or forecast) and the subsequent forecast. Earnings forecasts are more likely to be accompanied by buy/sell recommendations, and recommendations change more frequently, are less likely to be "hold" and are more likely to be extreme (strong buy or sell), consistent with a desire to signal the investment value of the research reports.

Fourth, how does MiFID II change incentives to curry favor with management? One of the hypothesized effects of MiFID II was to increase analysts' incentives to gain an information edge by cultivating links to management. (*Bloomberg*, 2019) Prior literature suggests that analysts wishing to curry favor with management tend to issue optimistic buy/sell recommendations and

pessimistic (beatable) earnings forecasts. Consistent with analysts seeking to curry favor with managers, we find that, following MiFID II, analysts are more likely to issue buy and strong buy recommendations and more likely to temper their EPS forecasts to make them easier to meet or beat.

Fifth, how does MiFID II change the firm's information environment? To the extent that analyst coverage decreases but individual analyst effort increases, the net effect for the information environment is ambiguous. Our results suggest that, on balance, MiFID II is associated with a deterioration in the information environment. The stock price reaction to individual analyst earnings forecasts increases, consistent with increased analyst effort. However, the increase in response to individual forecasts is not sufficient to completely offset the reduction in the aggregate number of forecasts. Overall, bid-ask spreads are higher and more of the information content in earnings remains to be disclosed at the earnings announcement date.

Taken together, our results provide initial evidence on the effects of MiFID II on European sell side analysts, the firms they follow, and the overall information environment. While the regulatory changes are recent, our results suggest that the effects have been relatively rapid and substantial. We believe the results should be of interest to several constituencies. First, European regulators are likely to be interested in early-stage results as they continue to implement and refine the MiFID II rules. Second, the SEC is in the process of considering how to respond to the changes in Europe under MiFID II and whether to implement similar unbundling rules in the US, so timely research is important to inform their deliberations. Third, from an academic perspective, MiFID II is an important shock with the potential to provide insight into the economic drivers of analyst activity.

2. Background and Related Literature

The Markets in Financial Instruments Directive (MiFID), implemented in 2007, was designed to increase transparency across the EU's financial markets and standardize regulatory oversight. The overriding aim was for all EU members to share a common, robust and transparent regulatory framework to enhance investor protection. Following the financial crisis, the EU set out to revise and strengthen the framework, resulting in MiFID II, which was designed to further strengthen cooperation across member states, and improve incentives and transparency in financial markets.

MiFID II was one of the most significant regulatory changes in recent history, and there has been substantial discussion and speculation in the business press with respect to its likely impact on brokerages, sell-side analysts, investment funds, corporate investor relations departments, investors and market efficiency.[2] While the potential effects are substantial, the directions, cross-sectional variation and magnitudes are less clear. The effects are subtle because the changes do not directly impact the research environment but, rather, increase flexibility for investment funds to separately purchase research and increase transparency over amounts paid for trading as opposed to research costs. Prior to the changes, regulators faced concerns that brokerages used "soft dollar" research services to attract trading volume from investment funds. Because research was bundled with trading costs, research was essentially "free" from the standpoint of investment funds and could be passed on to investors as part of execution costs. End investors could not

[2] For example, the CFA Institute surveyed 365 buy-side analysts in 2017 (CFA Institute, 2017) to understand the likely effects of MiFID II on investment funds. Similarly, Exane BNP Paribas – EY surveyed 300 European investor relations personnel in 2017 to predict the effects of MiFID II on corporations (Exane BNP Paribas, 2017). In addition, there have been numerous articles in the business press, particularly in Europe, exploring the effects of MiFID II.

readily evaluate whether either the trading commissions or the research expenditures were efficient because the costs could not be disentangled.[3]

The unbundling associated with MiFID II had potential implications for brokerages, investment funds and investors.[4] First, brokerages are required to unbundle research costs from execution costs, so investment funds can observe costs separately and decide what research to purchase. Second, investment funds are required to create research budgets and either charge research costs to investors using pre-agreed research payment accounts (RPAs) or absorb the costs themselves. In either case, the system puts pressure on research payments by fund managers, either because the costs must be justified to investors if passed on, or because they reduce the funds' profits if absorbed. Third, from the standpoint of investors, because they can observe amounts charged for research separately from trading, they can better optimize investment decisions.

While MiFID II does not directly limit the ability to charge for research, unbundling research costs makes them more visible and discretionary, creating pressure on brokerages and investment funds because investors can more easily observe amounts spent on research and adjust their demand accordingly. As a result, we predict that, to the extent MiFID II increased the transparency and discretionary nature of research spending, it increased pressure on brokerages and their sell side analysts to justify and signal the value added through their research reports. In particular, we examine five related multidimensional research questions:

[3] In theory, even with bundling, investors might have been able to partially infer the underlying research and trading costs prior to MiFID II. However, execution costs (even if bundled) are not typically disclosed separately in the body of investor reports and, even if disclosed, it is difficult to interpret the relative costs because they do not factor in important components such as bid-ask spreads or price pressure which can exceed direct trading costs. A primary goal of MiFID II was to make it straightforward for investors to observe, and potentially influence, research costs.

[4] MiFID II also included other provisions including improved reporting and regulations on dark pools, over-the-counter markets, and high-frequency trading, but only the provision on research bundling has clear direct implications for sell side analysts.

1. *How did MiFID II affect overall analyst coverage?* Most commentators predicted that MiFID II would lead to a significant reduction in sell-side analyst coverage.[5] Underpinning that prediction is the notion that, prior to MiFID II, there was "excess" coverage given incentives for brokerages to cover a broad set of stocks to attract trading volume, coupled with the fact that investors could not disentangle research from execution costs, making it difficult to evaluate the efficiency of research spending. (Exane BNP Paribas, 2017)

2. *Which firms are most affected?* In terms of firms that are likely to be most affected, the predictions are less clear because there are both demand and supply effects. On the one hand, following the logic of incremental contribution, the reduction is likely to be largest for the largest firms, especially those that already had high analyst following, and for which additional research was likely to be less productive (e.g., older firms in more stable sectors for which forecasts were generally accurate). (WSJ, November 28, 2018; Financial Times, January 17, 2019) On the other hand, the demand side suggests that smaller firms could lose more coverage because analysts would gravitate toward firms with more potential clients. (Peel Hunt, April 2018)

3. *How do analysts change their behavior?* The changes associated with MiFID II also likely affected the production function of analysts. Prior to MiFID II, brokerages often provided "waterfront" coverage (i.e., forecasts on all firms in a category), even if the incremental information content was low, because fund managers were not directly paying for the reports. (CFA Institute, 2017) Following MiFID II, there is a greater need to demonstrate value added,

[5] For example, in the CFA Institute survey, 78% of respondents expected to source relatively less research from the sell side after MiFID II. (CFA Institute, 2017) Similarly, in the Exane BNP Paribas survey, 90% of investor relations professionals expected MiFID II to result in reduced analyst coverage of their firm. (Exane BNP Paribas, 2017)

so we expect analysts to increasingly focus on smaller numbers of firms and work harder evaluating those firms to convince fund managers to pay for research. (Exane BNP Paribas, 2017) As a result, we expect to see more accurate forecasts, as well as more detailed analysis (e.g., more items forecasted) and a greater likelihood that reports also include buy/sell recommendations. In addition, we expect less "maintenance" research and more changes in forecasts and non-hold and extreme (e.g., strong buy or strong sell) recommendations. (Bloomberg, 2019)

4. *Are analysts more likely to curry favor with management after MiFID II?* Given the increased emphasis on value added research, commentators have suggested that links to management as a source of information will become increasingly important. (Exane BNP Paribas, 2017) Prior research suggests that analysts are more likely to receive preferential treatment from management if they issue positive recommendations and earnings forecasts that are conservatively biased. (Francis and Philbrick, 1993; Chen and Matsumoto, 2006; Mayew, 2008) As a result, we expect to see an increase in optimistic recommendations and in pessimistic earnings forecasts following MiFID II.

5. *How does MiFID II affect the firm's information environment?* The effect on the overall information environment is unclear. On the one hand, the predicted reduction in coverage could reduce the information available to markets. (Bloomberg, 2019) On the other hand, the improvement in the quality of research could more than offset the reduction in breadth of coverage. (Exane BNP Paribas, 2017)

As the preceding suggests, the predicted effects of MiFID II are broad and important. Given the recency of the changes, there is little existing research on the topic. The only other research of

which we are aware examining mandatory MiFID II adoption is a concurrent working paper (Guo and Mota, 2019) that examines annual earnings forecasts and also observes a drop in coverage, especially for large firms, and improvements in accuracy. Our paper is substantially broader by demonstrating not only the drop in coverage and improvements in accuracy, but also providing insight into the underlying factors that drive the changes as reflected in the types of firms that lose coverage, changes in the production function of analysts following MiFID II, the relationship between analysts and management, and the effect on the information environment for affected firms.[6]

In terms of firm characteristics, we document that it is not only large firms that lose coverage, but more generally firms for which the marginal analyst was likely contributing relatively little (e.g., firms with many other analysts and accurate consensus forecasts, and older firms in stable sectors). In terms of changes in analyst output, we show that analysts appear to add significantly to the content of their reports by expanding the breadth of their analysis (more disaggregated and detailed forecasts, and greater processing time), including more buy/sell recommendations, moving away from "hold" recommendations and less frequently issuing confirmatory reports. In terms of their relationship with management, analysts appear to curry favor by biasing their recommendations upwards and issuing beatable forecasts. Finally, and perhaps most importantly, our results suggest that, while individual analyst reports become more informative as reflected in a larger stock price response to individual forecast releases, the net effect on the overall information environment is negative due to the decreased overall analyst coverage, as evidenced

[6] In addition, our use of quarterly forecasts permits us to document more narrowly the change in effect around MiFID II adoption and the extent to which it persists across multiple periods, as well as matching more closely to the quarterly reporting frequency of our US control sample.

by less aggregate market response to analyst reports, larger stock price response at earnings announcement dates (i.e., less preemption) and greater information asymmetry in the market.

More generally, our research is related to the literature on "soft dollar" payments to brokerages. In the US, investment advisors must abide by fiduciary duty in managing their client accounts, including seeking best execution of transactions. However, safe harbor provisions permit advisors to accrue soft dollar research and brokerage services as long as the commission paid is "reasonable" in light of the execution and products or services received.[7] As a result, the client only observes the overall execution cost. Although soft dollar payments are pervasive and controversial, research on their incentive effects is limited because such payments are typically bundled with execution costs. While some have argued for the benefits of soft dollars as an efficient and effective arrangement (e.g., Johnsen, 2009), research such as Edelen et al. (2012) and Erzurumlu and Kotomin (2016) provides evidence that bundling creates opacity and harms investors.[8] However, research directly linking soft dollars to analysts' incentives is limited due to lack of data. Our research adds to that literature by providing a setting in which we can observe the effects of mandatory unbundling of research costs from trading costs.

3. Sample and Research Design

3.1 Sample

We use Compustat (Global) as our source of quarterly financial and market data for US (European) firms.[9] We download quarterly analyst forecast data for the upcoming quarter-end from

[7] See Biffany (2018) for a discussion.
[8] In addition, Hayes (1998) provides a model linking analyst incentives to trading commissions and Jackson (2005) documents that optimistic and high reputation analysts generate more trade for their brokerages.
[9] We exclude the UK in our analysis because the UK implemented Commission Sharing Agreements (CSA's) for research in 2006 and because quarterly forecasts are relatively rare. Results are very similar including the UK.

I/B/E/S.[10] Our sample period is from 1st quarter 2015 until 4th quarter 2018, and we define 1st quarter 2018 as the beginning of the post-MiFID II period. We identify European firms with quarterly analyst coverage as our treatment sample and US firms with quarterly coverage as our control sample.[11] We require that firms exceed $10 million in total assets.

Table 1 reports the countries in our sample, the number of firm-quarter observations, and the mean number of analysts covering the country's firms over the entire sample period. Our US control sample is substantially larger than our European sample, and US firms are followed by more analysts than European firms. Our European sample is spread across 25 countries, with Germany and Sweden contributing the most observations (2,526 and 2,393, respectively).[12]

3.2 Descriptive Statistics

Table 2, Panel A, presents descriptive statistics for our primary firm-, country-, analyst-, forecast-, and brokerage-level variables for our European sample. Definitions of all variables are included in Appendix A. Panel B presents descriptive statistics for the same variables but for our US sample. Among the control variables, the two samples are similar on many dimensions, although the European firms are somewhat smaller and younger than the US firms, and have lower market-to-book ratios and a lower frequency of losses. The median European firm has about $1.4 billion in total assets, is 18 years old and has a market-to-book ratio of 2.07. In Section 4.6, we assess robustness to propensity score matching and entropy balancing to ensure that any remaining differences between US

[10] We exclude firms that had no quarterly forecast coverage over the entire sample period.
[11] One potential concern is that some analysts following US firms may be partially affected by MiFID II because they are required to unbundle a subset of costs for European clients (we cannot observe the clients or costs associated with specific brokerages). To the extent that there is spillover to analysts following US firms, it should bias against our predicted results. As a practical matter, we find no evidence of a change in analyst following for US firms around MiFID II and our results are robust to dropping US firms as a control.
[12] For consistency between the European and US samples and to permit multiple observations in the post-MiFID II period, we focus on quarterly forecasts. Because we are consistent throughout our analysis, we know of no reason to expect our choice of quarterly reporting to bias our results although it does reduce the number of observations in some European countries. Guo and Mota (2019) document that coverage also decreases for annual forecasts.

and European firms do not affect our results. Results are also robust to dropping the US control firms (i.e., examining changes only within European firms), confirming that changes for the US firms do not drive the results.

Among the dependent variables, earnings announcement informativeness (*EAInfo*), liquidity (*BidAsk*), number of non-EPS variables forecasted by analysts (*NumOtherVars*), analyst forecast inaccuracy (*Inaccuracy*), and market reaction to individual analyst forecasts (*CAR*) are similar across the two samples.[13] US analyst forecasts are more informative in aggregate (*AnalyInfo*), and contain fewer sales forecasts (*SaleForecast*) or recommendations (*Recommend*). The primary differences are with respect to analyst coverage, with the European firms having substantially fewer analysts and each analyst covering fewer firms. One potential concern is that our results may be driven by European firms with few analysts. However, that should bias against our ability to document decreases in coverage. Further, as demonstrated in the empirical analysis, results are strongest for large firms and firms with more analyst coverage. In addition, results are stronger dropping firms with no analyst coverage pre-MiFID II, which significantly increases the number of analysts following the typical firm. Results are also robust to dropping firms with few analysts, to only including US controls with few analysts, to propensity score matching or to dropping the US controls entirely.

3.3 Research Design

To study the impact of MiFID II on analyst coverage of European firms, we estimate a difference-in-differences regression of analyst following on a number of firm and country level variables and fixed effects. We adopt a similar approach, with controls and fixed effects customized to the specific setting, for our other variables of interest. Our basic regression specification is:

[13] Descriptive statistics are over the entire sample period and do not reflect changes around MiFID II.

$$Coverage_{it} = \alpha + \beta_1 * I(TREAT) * I(POST) + X\beta + \gamma_i + \phi_t + \epsilon_{it}$$

$Coverage_{it}$, the dependent variable in our initial analysis, is computed by taking the log of one plus the number of analysts who issue quarterly EPS forecasts for a given firm during a given quarter. The primary variable of interest is *I(TREAT)*I(POST)*, which is an interaction of two indicator variables – *I(TREAT)*, which equals one if the firm is from a European country, and zero otherwise; and *I(POST)*, which equals one if the observation is from one of the four quarters in 2018, and zero otherwise. *X* is a vector of firm- and country-level control variables. We include firm and year-quarter fixed effects in our primary specifications (along with other fixed effects in our supplementary analyses) to control for unobservable firm- and time-trend characteristics that can affect analyst coverage.

Our primary firm-level controls include the logged value of total assets in US dollars (*Size*), standard deviation of daily returns (*RetVol*), profitability (*ROA*), standard deviation of quarterly ROA (*EarnVol*), a loss indicator (*LOSS*), intangible assets (*Intan*), leverage (*Lev*), market to book ratio (*MtB*), and firm age (*FirmAge*). To also control for country-level characteristics, we include logged GDP per capita (*lnGDPpercap*), and GDP growth (*GDPgrowth*). More detailed descriptions of these variables are presented in Appendix A.[14]

4. Results

4.1 Changes in Analyst Coverage

Table 3 presents our initial regression analyses for analyst coverage using various specifications. Panel A, Column 1, reports results with firm and year-quarter fixed effects, but no other

[14] Continuous, unlogged measures are winsorized at the 1 and 99% levels. The exception is the market-to-book ratio, which we winsorize at the 2.5 and 97.5% levels reflecting the frequency of extreme values driven by small denominators for firms with near-zero book values. Results are very similar if we instead winsorize market-to-book at the 1 and 99% levels.

control variables. We find a significant negative coefficient (coefficient estimate = -0.046, t-stat = -3.56) for our primary variable of interest, *I(TREAT)*I(POST)*, which suggests a drop in analyst coverage for European firms relative to US firms as a result of MiFID II. In Column 2, we supplement the analysis to include firm- and country-level control variables, along with country, industry, and year-quarter fixed effects. The results for our primary variable of interest, *I(TREAT)*I(POST)* become slightly stronger, both in terms of magnitude and statistical significance (coefficient estimate = -0.050, t-stat = -3.70). Results in Column 3 are the most restrictive in that we include firm and year-quarter fixed effects along with all of our control variables. Results for our primary coefficient of interest are strongest for this specification, both in terms of magnitude and statistical significance (coefficient estimate = -0.057, t-stat = -4.53).[15] In terms of economic significance, results from Column 3 indicate that, for the average EU firm in the sample, MiFID II is associated with an approximately 10% decline in analyst following.[16]

The fact that results are consistent across a range of controls is reassuring because it indicates that our conclusions are not sensitive to particular specifications. Going forward, we report results including firm and year-quarter fixed effects along with control variables (analogous to Table 3, Panel A, Column 3) because it is the most conservative specification in controlling for firm and time period effects, as well as a wide range of other variables.

One of the issues with the preceding analysis is that some of the firms in the treatment sample did not have quarterly analyst coverage in the pre-MiFID II period and, hence, could not lose analyst coverage. An alternate approach is to repeat the analysis conditional on firms having positive analyst coverage pre-MiFID II. Results reported in Column 4 repeat the analysis constraining the sample to firms with pre-MiFID II analyst coverage. The magnitude of the coefficient on *I(TREAT)*I(POST)*

[15] Robustness tests in Table 9 indicate that results remain at least as strong with propensity score matching (coefficient estimate = -0.071, t-stat = -5.01) or entropy balancing (coefficient estimate = -0.053, t-stat = -3.72).
[16] The economic significance is computed using mean pre-MiFID II number of analyst forecasts for EU firms, 1.82, and the coefficient estimate of -0.057.

nearly doubles (coefficient estimate = -0.112, t-stat = -5.47). In economic terms, the coefficient estimate translates into a 15% decrease in analyst coverage for firms with coverage prior to MiFID II.

One potential concern with the preceding analyses is that the difference-in-differences design relies on the parallel trends assumption, which is not directly testable. However, we can descriptively evaluate the trends by plotting residual analyst following over time for US and European firms, including the control variables from our main specification in Table 3, Panel A, Column 3 (firm size, return volatility, earnings volatility, a loss indicator, intangibles, leverage, profitability, firm age, market to book ratio, and firm and year fixed effects). Figure 1 plots the results.

Several points are worth noting. First, there is no apparent trend for the US control firms over the sample period, and residuals for all periods pre- and post-MiFID II for the US control firms are insignificantly different from zero. This provides confidence that any observed results for the EU firms are not a result of general macroeconomic factors. Second, for the European firms, there is no evidence of a trend prior to the 4th quarter, 2017 and the residuals for those periods are never significantly different from zero. Third, analyst following for the European firms drops sharply in the 4th quarter, 2017, and remains lower throughout 2018, with the residuals significantly negative for every quarter through 2018.[17] The fact that the drop in coverage appears to be permanent is reassuring because it helps to rule out the possibility of some other transitory shock around year-end 2017. Taken together, the pattern is consistent with the regression results in Table 3, Panel A, in suggesting a significant and sustained drop in analyst following associated with MiFID II for the European firms with no corresponding pattern for the US control firms.[18]

[17] To further ensure that our results do not reflect changes in other economic variables for the European firms relative to the US firms, we conduct a similar analysis for our control variables from Table 3, Panel A, Column 3, comparing the pre- and post-MiFID II periods but find no evidence of a similar pattern.

[18] The only potentially surprising result is the fact that the initial decrease occurred in the 4th quarter of 2017, suggesting some degree of anticipation (since the requirements technically changed effective January 3, 2018). By the second half of 2017, the changes had been legislated and it was clear that they would take effect at the beginning of 2018, so it is not surprising that there could be some anticipatory effect.

4.2 Variation in the effect of MiFID II on analyst coverage across firms

We would not expect MiFID II to affect analyst coverage across all European firms equally. In particular, because research payments are now unbundled from trading costs, we expect increased scrutiny of analyst research, with investment funds less willing to buy additional research on a firm if the marginal value added is unlikely to be high. As a result, we expect analyst coverage to decrease more for firms for which the incremental contribution of additional research is unlikely to be high. In particular, we expect larger drops in coverage for large firms that are already covered by many other analysts, as well as for older and less volatile firms, and for firms for which existing forecast accuracy is high.

With respect to size, we divide firms into small, medium, and large terciles based on total assets during 2017; for age, analyst coverage, return volatility and forecast accuracy, we split at the 2017 median values. To test for cross-firm variation in the effect of MiFID II, we interact *I(TREAT)*I(POST)* with indicators for both large and medium firms for size, and with indicators for above median average 2017 values for the other firm characteristics.[19] We base our analysis on the specification in Table 3, Panel A, Column 3 (i.e., with our full set of controls and firm and year fixed effects).

Turning first to firm size, results presented in Table 3, Panel B, Column 1, indicate that the effect of MiFID II on analyst following was most pronounced for medium and large firms, with significant negative coefficients, while the effect for small firms was statistically insignificant. In terms of economic significance, the average large (medium) EU firm lost nearly 13% (25%) of analyst

[19] We include all main effects along with our triple interactions in our cross-sectional regressions. However, for parsimony, we do not present the coefficient estimates for all main effects.

coverage following MiFID II relative to the US controls.[20] A potential interpretation is that the incremental contribution of an additional analyst for medium and large firms tends to be less than for small firms because there is already substantial analyst coverage of larger firms. Consistent with that explanation, in Column 2 we report results splitting firms based on the level of coverage controlling for size, and find that the decrease in coverage is significantly greater for firms with higher analyst coverage prior to MiFID II.

Columns 3 through 5 report analyses splitting firms based on age, volatility and forecast accuracy. Once scrutiny is increased, research payments to analysts are more likely to be justifiable if the underlying economics of the firm make it inherently difficult for the investment fund to understand and forecast (e.g., younger, more volatile firms with less accurate consensus analyst forecasts). Results in Columns 3 through 5 indicate that, consistent with expectations, the MiFID II regulations were associated with particularly large reductions in analyst coverage for older firms (Column 3), firms with lower return volatility (Column 4), and firms with greater consensus forecast accuracy (Column 5), in the year prior to MiFID II. Taken together, the results in Table 3 provide evidence that MiFID II decreased analyst coverage of European firms, and that this effect was more pronounced for firms for which it was more likely to be difficult to justify the marginal research expenditure (medium/large firms with higher analyst coverage that were older and less volatile with greater consensus forecast accuracy).

4.3 Effect of MiFID II on analysts

The preceding evidence suggests that MiFID II had significant firm-level effects by reducing analyst coverage for firms for which their marginal contribution was likely lowest. The increased

[20] The fact that the largest drop is for medium-sized firms is consistent with predictions in the business press; e.g., "Medium-sized listed companies are likely to suffer most. They are small enough to be easily shed by brokers, but large enough that their shares are widely owned by all kinds of investors." (WSJ, Nov. 28, 2018).

scrutiny also likely affected decisions by brokerages as to where to allocate effort by remaining analysts. In particular, brokerages likely redeployed analysts in ways that maximized their value added and could justify research spending by investment funds. We expect remaining analysts to follow fewer firms so that they can do more in depth analysis on each one they follow. In addition, we expect analysts to issue more thorough and detailed reports on the remaining firms in their portfolio, and for their forecasts to become more accurate. We also expect an increase in the likelihood that analyst reports will include actionable information. In particular, we expect more reports to include a buy/sell recommendation, for those recommendations to be less likely to be "hold" (as opposed to "buy" or "sell") and for recommendations to change more frequently (both because more information has been generated and because it is more difficult to convince funds to buy additional research if the recommendation is a "hold" or has not changed since the last report).

In Table 4, we report regressions of *AvgAnalystFirms* (the average number of firms covered in total by each analyst following a given firm) and *AvgAnalystForecast* (the average number of total quarterly EPS forecasts issued by each analyst following a given firm) on *I(TREAT)*I(POST)* and the full set of controls and fixed effects from Table 3. Results in Table 4 indicate that following MiFID II adoption, remaining analysts on average cover fewer firms and issue fewer forecasts, as the coefficients on *I(TREAT)*I(POST)* are significantly negative for both dependent variables. One interpretation is that, as scrutiny increased to justify costly research, analysts focused their attention more on a limited subset of firms and provided more in depth research on the firms they still covered.[21]

To provide further evidence on that interpretation, we examine the amount of detail provided in the analyst reports, the accuracy of the forecasts, the extent to which recommendations are provided, the nature of those recommendations and the amount of time spent developing the forecasts (as

[21] *Bloomberg* (2019) notes, "it is increasingly difficult for analysts to prove their worth, just as their [asset managers'] budgets are being slashed. Predictably, by putting a price tag on research, the European Union rules have made asset managers more selective about what they need."

measured by the lag since the previous forecast and since the previous earnings announcement). In these analyses, the level of observation is the individual forecast made by a given analyst for a given firm during (and for) a given quarter.[22] We require that a forecast has a non-missing EPS forecast value, and that the analyst identifier is not coded as missing in I/B/E/S. For our least restrictive estimation at the analyst-quarter-firm-forecast level, we have nearly 500,000 forecasts.

First, we examine whether analysts following European firms appear to put more effort into each of their reports following MiFID II as reflected in more detailed and more accurate forecasts. In particular, we investigate whether, post-MiFID II, analysts are more likely to issue supplementary sales forecasts and forecasts of more other variables (besides EPS), and whether EPS forecasts become more accurate. Prior research suggests that the presence of supplementary sales forecasts increases the credibility of earnings forecasts and that analysts work harder to arrive at their EPS forecast when they build up their forecasts from disaggregated components of earnings (Keung 2010). In addition to sales, analysts sometimes forecast a variety of other line items (Bradshaw 2011). Ertimur et al. (2011) suggest that analysts improve their reputation and increase their chances of promotion if they issue disaggregated forecasts, signaling greater effort. Finally, prior literature suggests that analysts who supplement earnings forecasts with forecasts of other items tend to issue more accurate EPS forecasts, consistent with benefits to analysts adopting a more thorough, structured and disciplined approach to forecasting earnings (i.e., Call et al. 2009; Keung 2010).

We estimate a linear probability model with: 1) an indicator that equals one if the given analyst forecast contains a supplementary sales forecast, and zero otherwise (*SaleForecast*); 2) the natural log of one plus the number of non-EPS variables also forecasted by a given analyst for a given firm in a given quarter (*NumOtherVars*); and 3) the absolute value of the difference between forecasted EPS and actual EPS, scaled by stock price two days prior to the forecast (*Inaccuracy*). *I(TREAT)*I(POST)*

[22] On I/B/E/S, this corresponds to a forecast period indicator (FPI) of 6. We do not consider longer horizon quarterly forecasts or annual forecasts given our limited post-MiFID2 period.

remains our primary explanatory variable, and we include the same firm- and country-level controls as in Tables 3 and 4.

We further add a number of brokerage-, forecast-, and analyst-level control variables. We include log of one plus brokerage size measured as the number of analysts at a given brokerage house (*lnBrosize*), analyst experience at the given firm (*FExp*), analyst general sell-side experience (*GExp*), forecast horizon relative to the earnings announcement (*FHor*), log of one plus the number of industries covered by the analyst (*lnAnaInd*), and the log of one plus the number of firms covered by the analyst (*lnAnalystFirms*). Variable definitions are reported in Appendix A. We also include firm, analyst, brokerage, and year-quarter fixed effects in each regression to ensure that results do not simply reflect variation in firm, analyst or brokerage composition, or time period trends.[23]

Results presented in Table 5, Panel A, suggest that analysts significantly increased the number of items (other than EPS) that they forecast following MiFID II. As reported in Column 1, analyst reports are significantly more likely to contain supplementary sales forecasts after the adoption of MiFID II. Similarly, results reported in Column 2 indicate that, post-MiFID II, analysts issue significantly more forecasts of other line items. In terms of economic significance, for the median European forecast from the pre-MiFID II period, the number of other items forecasted increases by roughly 12% following the adoption of MiFID II.

Taken together, these results are consistent with the notion that analysts expend significantly more effort in forecasting earnings after MiFID II. However, it could be the case that the increase in the number of items being forecast simply reflects an attempt to create the impression of greater effort by providing more disaggregated (but potentially arbitrary) detail. To help separate those two possibilities, we directly examine the accuracy of forecasts after MiFID II. Table 5, Panel A, Column 3 examines whether forecasts become more accurate following MiFID II. Results for *INACCURACY*

[23] Analyst fixed effects are particularly important in this context because they ensure that results reflect within-analyst variation as opposed to the overall changes in coverage documented earlier.

indicate a significantly negative coefficient on *I(TREAT)*I(POST)*, providing evidence consistent with increasing accuracy of European firm forecasts in the post-MiFID II period. Coupled with the prior analyses, results in Table 4 and Table 5, Panel A, suggest that, in response to MiFID II, analysts focus their attention on a smaller number of firms, and redeploy their efforts to more thoroughly and accurately assess the remaining firms in their portfolio.

An alternate approach to assessing whether analysts appear to increase their value added for remaining portfolio firms is to assess whether they are more likely to include stock recommendations in their reports following MiFID II and, if so, the characteristics of those recommendations. Francis and Soffer (1997) provide evidence that recommendations are incrementally informative to earnings forecasts, suggesting that they entail greater effort by analysts.

Because buy/sell recommendations require a more in-depth analysis (e.g., longer term forecasts and cost of capital estimates), we expect greater effort post-MiFID II to be accompanied by a greater willingness to issue recommendations. In addition, the inclusion of recommendations is likely to increase the value added to the investment fund considering the potential purchase of research services. The recommendations are likely to be of particular interest to the fund manager if they suggest some action (e.g., if the recommendation changes from previous recommendations, if the recommendation is a buy or sell as opposed to a hold, or if the recommendation is more extreme such as a strong buy or strong sell).[24]

To evaluate changes in recommendations around MiFID II, we repeat the analysis from Table 5, Panel A, replacing the dependent variables with variables based on recommendations. We include indicator variables for each of the recommendation scenarios at the individual forecast level, and

[24] For example, Bloomberg (2019) notes, "Why would a client pay to receive a note that says results are in the line?", and "There is even more pressure now to write reports with concrete conclusions" as opposed to "maintenance research."

estimate linear probability models for each variable of interest on *I(TREAT)*I(POST)* with our control variables and fixed effects from Panel A.

Results reported in Table 5, Panel B, suggest that there were significant changes in recommendations for EU firms following MiFID II. Results in Column 1 indicate that, consistent with the evidence on more disaggregated forecasts from Panel A, analyst reports post-MiFID II were significantly more likely to include a stock recommendation. Results in Column 2 indicate that, not only were there more recommendations, but the recommendations were more likely to be "new" in the sense that they had changed from the previous recommendation. Results in Column 3 indicate that recommendations post-MiFID II were less likely to be "hold" and results in Column 4 indicate that recommendations were more likely to be extreme ("strong buy" or "strong sell").

Taken together, the results for recommendations are consistent with the notion that, following MiFID II, analysts felt greater pressure to demonstrate the potential value of their research to investment funds by including recommendations with their earnings forecasts. Further, those recommendations were more likely to suggest action by the investment fund (i.e., the recommendation was more likely to have changed and was less likely to be a hold).

To provide further evidence on the effort expended by analysts following MiFID II, we examine two measures of analyst revision timeliness – the lag between the prior quarter earnings announcement and the first revision that follows for each analyst (*RevisionResponse*), and the lag between the analyst's revision and the prior revision for the same firm (*RevisionLag*). Prior literature such as Ivkovic and Jegadeesh (2004) indicates that revisions are least informative in the week after earnings announcements and that the information content of revisions generally increases as the time until revision increases. Lehavy et al. (2011) find increased lags in analyst reports in settings in which analysts expend greater effort in arriving at their forecast (e.g., for firms with less readable annual reports). To the extent that MiFID II creates incentives for greater effort on the part of analysts (e.g.,

to permit more accurate and disaggregated forecasts as well as informative recommendations), we expect reporting lags to increase.[25]

Results in Table 5, Panel C provide evidence that both measures of response times (i.e., relative to earnings announcements and relative to previous forecasts) increase significantly for European firms following MiFID II adoption. Coupled with the prior results in Table 4 and Table 5, Panels A and B, it appears that the unbundling of costs associated with MiFID II raised the hurdle for analyst research, resulting in more time-consuming, thorough and accurate assessments, along with an increased likelihood of recommendations that conveyed clear buy/sell signals.

4.4 MiFID II and currying favor with management

Our results to this point suggest that MiFID II decreased the demand for sell side analysts and that remaining analysts faced increased scrutiny and pressure to demonstrate added value from their research. Although results in the previous sections suggest that they did so, at least in part, by increasing effort, a related approach would be to curry favor from managers. Anecdotal evidence suggests that sell side analysts covering European firms after MiFID II faced increased incentives to cultivate positive relationships with management to facilitate access. (*Bloomberg* 2019) Similarly, investor relations professionals indicate that direct access to management became more important for analysts after MiFID II to enhance the information in their research reports.[26]

While it is difficult to measure efforts to curry favor with managers, prior research suggests that firms prefer optimistic recommendations and that analysts that issue buy or strong buy

[25] There is, of course, a limit to how long a forecast can lag before it becomes stale. Prior to MiFID II, analysts had incentives to issue frequent reports with minimal new information because their cost was bundled with trading costs. However, once investment funds have the option of purchasing only research that is likely to be most informative and investors are able to hold them accountable for those choices, funds are likelier to hold out for research that is thorough and has significant new information content.

[26] See https://www.irmagazine.com/corporate-access-MiFID-ii/corporate-access-moving-direct-model-post-MiFID-ii.

recommendations enjoy enhanced access to management (Francis and Philbrick 1993; Chen and Matsumoto 2006; Mayew 2008). To the extent that MiFID II increased pressure on analysts to provide informative reports, we expect that it also increased incentives to curry favor with managers and, hence, to issue optimistic recommendations. To evaluate that possibility, we examine changes in the proportion of optimistic recommendations following MiFID II, again controlling for a wide variety of economic factors and relative to the US controls. Our prediction is that the frequency of buy and strong buy recommendations increased following MiFID II.

Table 6, Panel A presents regression results focusing on recommendation optimism. In particular, we test whether MiFID II was associated with analysts issuing more optimistic recommendations (*OptimRec*; buy or strong buy) relative to pessimistic recommendations (*PessimRec;* underperform (sell) or strong sell). In addition, we separately examine whether MiFID II was associated with more extreme buy (*StrongBuy*) recommendations.

Results for recommendation optimism are presented in Table 6, Panel A, Column 1. Overall, recommendations of European firms are significantly more likely to be optimistic following MiFID II controlling for a wide range of other variables including firm profitability. One possible concern is that the increase in optimistic recommendations simply reflects the decrease in hold recommendations documented earlier. If that is the case, there should also be more pessimistic recommendations. However, results in Column 2 indicate that there was not a significant increase in pessimistic recommendations following MiFID II. Column 3 reports results for strong buy recommendations. As with optimistic recommendations more generally, there is a significant increase in strong buy recommendations.

An alternative approach is to consider changes in EPS forecasts following MiFID II. Unlike stock recommendations, prior literature suggests that analysts cater to firms by lowering EPS forecasts to make it easier for managers to "meet or beat." (e.g., Ke and Yu 2006; Baik and Yi 2007; Feng and McVay 2010). We consider two dependent variables to assess whether EPS forecasts were lowered

following MiFID II – *OptimEPSRev*, an indicator that equals one if the EPS forecast was revised upwards relative to the previous EPS forecast, and zero otherwise; and *PessimEPSRev*, an indicator that equals one if the EPS forecast was revised downwards. Results presented in Panel B suggest that forecasts of European firms in the post-MiFID II period were significantly more likely to be revised downwards (Column 1) and significantly less likely to be revised upwards (Column 2).

Overall, the evidence in Table 6 is consistent with the notion that analysts responded to MiFID II by issuing recommendations that were more optimistic (more buy and especially more strong buy recommendations), while simultaneously lowering earnings forecasts. While circumstantial, combined with the prior literature this evidence suggests that analysts responded to increased pressure associated with MiFID II by adjusting forecasts and recommendations in ways that were more likely to curry favor with management.[27]

4.5 Market Reaction Tests

4.5.1 Forecast Level Analysis

Our prior results suggest that analysts increased the amount of effort in forecasting firms' financial information post-MiFID II. While conclusions are consistent across a range of measures, it is possible that some of the results reflect "window dressing" rather than substantive changes. For example, analysts might have reported more disaggregated forecasts without substantially increasing effort.[28] If the forecasts provided by analysts reflect greater effort and, therefore, have greater information content, there should be a larger stock price response to analyst forecasts following MiFID

[27] The evidence of optimism with respect to recommendations and pessimism with respect to forecasts is also interesting because it helps to mitigate the possibility that the results are explained by factors other than those explicitly controlled in the regression. It is difficult to envision changes in underlying economics that would both increase analyst recommendations and reduce EPS forecasts.

[28] The increase in forecast accuracy, however, is more difficult to reconcile with a window dressing explanation.

II. In addition to providing potential confirmatory evidence for our prior results, this analysis also permits initial insight into changes in the information environment around MiFID II.

To provide evidence on changes in the information content of earnings forecasts, we examine whether the absolute value of market-adjusted cumulative abnormal returns measured in the three-day window around earnings forecasts (*CAR*) for EU firms increased relative to US firms following MiFID II. We estimate the same basic difference-in-difference model including the range of controls and fixed effects, as well as the control sample of US firms, from our previous analysis. To the extent that the information content of analyst reports increased following MiFID II, we predict a positive and significant coefficient on *I(TREAT)*I(POST)*. Results reported in Table 7, Column 1 are consistent with the conclusion that the information content of analyst reports increased after MiFID II. In particular, the coefficient estimate on *I(TREAT)*I(POST)* is positive and statistically significant at the 1% level. Coupled with the prior analyses, these results support the conclusion that the information content of forecasts increased following MiFID II.

While the increase in information content is consistent with increased effort on the part of analysts, the evidence is circumstantial. An alternate approach is to focus on cases in which analyst effort appears to have increased to better understand the mechanism underpinning the increase in information content. In particular, we (and the prior literature) have argued that an increase in the number of items being forecast is evidence of greater effort and more information production on the part of analysts. If that is the case, we should observe a greater increase in market response in cases in which forecasts post-MiFID II contained more disaggregation.

To examine that question, we create an indicator variable, *ManyVar*, that equals one if the forecast contains more variables than the sample median of *NumOtherVars*, and zero otherwise. We interact *I(TREAT)*I(POST)* with *ManyVar* and estimate the effect on *CAR*. Results are reported in Table 7, Column 2. First, we find that *ManyVar* is significantly and positively associated with *CAR*, confirming that, overall, analyst reports containing forecasts of more variables are more informative.

More importantly, the coefficient estimate for *I(TREAT)*I(POST)*ManyVar* is also significant and positive, suggesting that the increase in informativeness of analyst reports following MiFID II is most pronounced for forecasts with increased disaggregation. Coupled with the prior evidence, this result reinforces the conclusion that, while MiFID II reduced analyst coverage, the remaining reports became more informative reflecting increased analyst effort and information production.

4.5.2 Firm Level Analysis

The preceding analyses suggest two countervailing forces potentially affecting the firm-level information environment following MiFID II. On the one hand, analyst following decreased which, all else equal, would harm the information environment. On the other hand, remaining research became more informative which would, all else equal, improve the information environment.

To assess which force dominates, we first perform an analysis in which we cumulate all stock price response in a given quarter associated with earnings forecasts. In particular, we create an aggregate analyst informativeness variable (*AnalyInfo*), computed by summing the absolute market-adjusted returns for all forecast revision dates in a given quarter scaled by the sum of all absolute market-adjusted returns in the quarter (Frankel et al. (2006), Lehavy et al. (2011), Merkley et al. (2017)). Loosely speaking, *AnalyInfo* measures the proportion of information during the quarter provided through analysts' reports. To provide further insight into the mechanisms, we also disaggregate *AnalyInfo* into informativeness of forecasts without recommendations (*EPSOnlyInfo*) and of forecasts with recommendations (*RecommendInfo*).

Results are reported in Table 8, Panel A. Results in Column 1 indicate a significant, negative coefficient on *I(TREAT)*I(POST)* for *AnalyInfo*, suggesting decreased aggregate informativeness of analyst reports in general for European firms following MiFID II. This result suggests that the increase in the informativeness of individual analyst reports documented in Table 7 is more than offset by the decrease in the aggregate number of analyst reports documented in Table 3. Put another way, while

individual analyst reports became more informative (Table 7), analyst reports in aggregate became less informative (Table 8) because of the decrease in analyst coverage (Table 3).

To provide further descriptive evidence, Columns 2 and 3 split the types of analyst reports into two categories based on whether they contained recommendations. Column 2 reports results for forecasts without recommendations. The significant negative coefficient on *I(Treat)*I(Post)* indicates that the aggregate information contained in analyst reports without recommendations decreased in the post-MiFID period. However, results in Column 3 for *RecommendInfo* indicate that there was a significant increase in informativeness of reports that contained recommendations.

Two points are worth noting. First, as discussed earlier, reports without recommendations tend to be less informative and the frequency of such reports dropped following MiFID II, which explains the decrease in their aggregate information content. Reports with recommendations, on the other hand, tended to increase in thoroughness and frequency following MiFID II, which explains the increase in their aggregate information content. However, reports with recommendations remained in a distinct minority even after MiFID II (only about 11% of post-MiFID II reports for European firms), so their relative increase in information content was not sufficient to offset the decrease in information content from reports without recommendations. As a result, overall analyst report informativeness declined significantly at the firm level.

We also apply a second approach to understand the firm-level information environment based on Merkley et al. (2017). In particular, we argue that, if MiFID II reduced the amount of earnings-related information available to investors during the period, there should be a stronger stock price response at the earnings announcement because less of the earnings information has been ferreted out during the period by analysts. To test that prediction, we calculate a measure of earnings announcement information content (*EAINFO*) based on stock returns around earnings announcement dates, similar to Francis et al. (2002) and Merkley et al. (2017).

In particular, we calculate the absolute market-adjusted CARs over the three-day window around earnings announcements for each firm-quarter and estimate a similar difference-in-difference regression as in Table 8, Panel A. Results, reported in Table 8, Panel B, Column 1, indicate a significantly positive coefficient estimate for *I(TREAT)*I(POST)*, suggesting increased earnings announcement market reactions for EU firms relative to US firms following MiFID II adoption. This supports our previous results suggesting a diminished "information discovery" role played by analysts in the post-MiFID II period as a result of the decline in analyst research, leaving more of the information content for the earnings release. (Chen et al. 2010)

Finally, to more directly address the transparency of the information environment, we examine bid-ask spreads of European firms relative to US firms before and after MiFID II. Bid-ask spreads proxy for information asymmetry, with higher spreads indicating greater information asymmetry among market participants (e.g. Copeland and Galai, 1983). We measure bid-ask spreads (*BIDASK*) as the mean daily spread over a firm-quarter where the daily spread is calculated as the absolute difference between the bid and ask prices, divided by the average of the bid and ask. Higher values of *BIDASK* correspond to lower liquidity and suggest greater opacity. To the extent that MiFID II resulted in less information being available to market participants, we expect higher bid-ask spreads during the quarter.

Regression results, presented in Table 8, Panel B, Column 2, indicate that bid-ask spreads increased for European firms relative to US firms in the post-MiFID II period.[29] Subject to the caveat that bid-ask spreads are a crude measure of information changes and are difficult to link to a specific cause, taken in conjunction with the prior analyses the results support the notion that decreased analyst research following MiFID II was associated with a deterioration in the information environment as reflected in increased information asymmetry and decreased liquidity. Taken as a whole, the results in Table 8 suggest that, although MiFID II led individual analysts covering European firms to issue more

[29] Results are robust to estimating the bid-ask spread in logged form.

comprehensive, accurate, and informative forecasts, the decline in analyst coverage at the firm level was associated with an overall deterioration in firms' information environments.

4.6 Robustness Tests

In our primary analyses, we use European firms as our treatment sample, and US firms as our control sample. Although we control for a variety of firm level fundamentals, along with firm fixed effects, in our regressions, we conduct several additional robustness tests to mitigate the possibility that differences between the US and European samples might drive our results.

The first robustness test is based on propensity score matching. In this test, we create a propensity score for each EU observation in our sample using the control variables from Table 3. Using the nearest neighbor method, we identify the two closest US observations by propensity score for each EU observation and include them in the control sample. Hence, our sample size decreases significantly, but the matched sample ensures more similar fundamentals between treatment and control groups.

The second robustness test applies entropy balancing, a data preprocessing method that reweights a dataset to achieve covariate balance between treatment and control groups (Hainmueller 2012). This approach relies on a maximum entropy reweighting scheme that calibrates unit weights so that the reweighted treatment and control groups satisfy a large set of pre-specified balance conditions simultaneously. Again, the balanced variables are based on the controls from Table 3.

Results for the analyst coverage regressions at the firm level (analogous to Table 3) incorporating propensity score matching and entropy balancing are presented in Table 9. The coefficient estimates on *TREAT*POST* remain significant and negative with either similar or greater magnitude and statistical significance relative to our primary analyses, suggesting that the

decrease in analyst following for European firms following MiFID II is robust to methodologies matching or balancing firm fundamentals in the control sample.

As a final analysis to ensure that our results are not driven by the US firm control sample, we repeat the analysis of analyst coverage without a control sample. This also helps to mitigate the potential concern that MiFID II might have had spillover effects for US firms (although those effects should bias against finding our predicted results). As noted earlier, we already have evidence on this point from the parallel trends graph in Figure 1. In particular, all of the confidence intervals for the US firms and European firms are insignificant prior to the 4th quarter of 2017 and only the residuals for the European firms become significantly different from zero in 2018. However, for completeness, we estimate the pooled regression analogous to Table 3, Panel A, Column 3, separately for the European and US firms. The untabulated results are very similar to Figure 1 in that we find a significant negative effect of MiFID II for European firms but no effect for US firms, providing additional comfort that our results are not driven by the control sample.

5. Summary and conclusions

We provide initial evidence on the effects of the European Union's MiFID II, which mandated the unbundling and separate pricing of sell side analyst research beginning in 2018. The intended goal was to increase transparency and flexibility in payments for research by investment funds. Prior to MiFID II, brokerages typically bundled payments for research with trading costs, so investment funds did not pay for research separately and their investors could not disaggregate the discretionary component of expenses associated with research. With MiFID II's new unbundling requirement, investment funds have more flexibility in determining whether and in what contexts to pay for research, and investors have greater transparency, permitting them to

apply greater scrutiny over incremental research costs incurred on their behalf by investment funds.

We document a significant reduction in analyst quarterly forecast coverage of EU firms (relative to a control sample of US firms) following the implementation of MiFID II, consistent with many commentators' speculations. Furthermore, we find that the decrease in coverage was greatest for firms that, prior to MiFIDII, were (1) larger, (2) had greater analyst coverage, (3) were older, (4) were less volatile, and (5) had more accurate consensus forecasts. Taken as a whole, this analysis provides evidence that the effect of MiFID II was most pronounced for firms for which it was more difficult to justify additional research expenditures.

We also provide evidence that the analysts who remained following MiFID II tended to follow fewer firms and issue fewer forecasts, suggesting increased focus. In addition, they appear to have increased their efforts on the firms that they continued to cover. Specifically, quarterly EPS forecasts became more accurate and analyst reports were more likely to include disaggregated forecast components. In addition, forecasts were more likely to include stock recommendations, which were more likely to have changed since the previous recommendation, were less likely to be "hold" recommendations and were more likely to be extreme recommendations ("strong sell" or "strong buy"), consistent with analysts attempting to convey more actionable information in their reports to justify the (unbundled) research costs.

We predict that MiFID II also increased analysts' incentives to gain an informational advantage by cultivating links to firm management. We find that, following MiFID II, analysts were more likely to issue optimistic ("buy" and "strong buy") recommendations and were more likely to reduce their EPS forecasts, making the forecasts easier for managers to meet or beat. Coupled with prior research, this evidence is consistent with analysts responding to increased

pressure associated with MiFID II by seeking to curry favor with managers in order to facilitate access to internal firm information.

To mitigate the possibility that increased detail in analysts' reports simply reflects "window dressing" rather than resulting from substantive effort, we show that the information content of forecasts increased following MiFID II as reflected in larger stock price reactions to individual forecast revisions. However, given that analyst coverage decreased following MiFID II, it is not clear that an increase in information per forecast would offset the decrease in the total number of forecasts. Consistent with the latter possibility, the aggregate information conveyed by analyst forecasts appears to have decreased following MiFID II. Also consistent with that interpretation, we document a larger stock price response to earnings announcements post-MiFID II (suggesting that, in aggregate, analyst uncovered less information during the quarter), and higher average bid-ask spreads. Thus, it appears that the increased effort by individual analysts was more than offset by the decrease in the number of analyst providing coverage following MiFID II.

Taken together, our results provide initial large sample evidence on the effects of MiFID II. While the regulation only went into effect in 2018 and, hence, our sample period is limited, our results suggest that the effects of MiFID II were relatively rapid and substantial for both sell side analyst research and the overall information environment. We believe our results should be of interest to the EU as it assesses the effectiveness of MiFID II and to the SEC in its ongoing deliberations as to whether to implement a similar system in the US, as well as to analysts and investors in European markets.

References

Baik, B., & Yi, H. (2006). Are affiliated analysts more likely than unaffiliated analysts to provide EPS forecasts that management can meet or beat?. SSRN. https://doi.org/10.2139/ssrn.817569

Biffany, B. (2018). Fixing Soft Dollars Is Not That Hard: A Consent and Reporting Framework for Regulating Client Commission Arrangement. Duke LJ, 68, 141.

Bloomberg L.P. (2019) Research Analysts' Existential Crisis Enters MiFID II Era. Retrieved May. 8, 2019 from https://www.*Bloomberg*.com/news/articles/2019-01-03/the-research-analyst-s-existential-crisis-enters-MiFID-ii-era.

Brown, L. D., Call, A. C., Clement, M. B., & Sharp, N. Y. (2015). Inside the "black box" of sell‐side financial analysts. *Journal of Accounting Research*, *53*(1), 1-47.

Bradshaw, M. T. (2011). Analysts' forecasts: what do we know after decades of work?. *Available at SSRN 1880339*.

Call, A. C., Chen, S., & Tong, Y. H. (2009). Are analysts' earnings forecasts more accurate when accompanied by cash flow forecasts?. *Review of Accounting Studies*, *14*(2-3), 358-391

CFA Institute (2017). MIFID II: A New Paradigm for Investment Research. Retrieved May. 8, 2019 from https://www.cfainstitute.org/-/media/documents/support/advocacy/mifid_ii_new-paradigm-for-research-report.ashx.

Chen, X., Cheng, Q., & Lo, K. (2010). On the relationship between analyst reports and corporate disclosures: Exploring the roles of information discovery and interpretation. Journal of Accounting and Economics, 49(3), 206-226.

Chen, S., & Matsumoto, D. A. (2006). Favorable versus unfavorable recommendations: The impact on analyst access to management‐provided information. *Journal of Accounting Research*, *44*(4), 657-689.

Copeland, T. E., & Galai, D. (1983). Information effects on the bid‐ask spread. *the Journal of Finance*, *38*(5), 1457-1469.

Edelen, R. M., Evans, R. B., & Kadlec, G. B. (2012). Disclosure and agency conflict: Evidence from mutual fund commission bundling. Journal of Financial Economics, 103(2), 308-326.

Ertimur, Y., Mayew, W. J., & Stubben, S. R. (2011). Analyst reputation and the issuance of disaggregated earnings forecasts to I/B/E/S. *Review of Accounting Studies*, *16*(1), 29-58.

Erzurumlu, Y. Ö., & Kotomin, V. (2016). Mutual Funds' Soft Dollar Arrangements: Determinants, Impact on Shareholder Wealth, and Relation to Governance. Journal of Financial Services Research, 50(1), 95-119.

Exane BNP Paribas (2017). MIFID II: A New Paradigm for Investment Research. Retrieved

May. 8, 2019 from https://www.ey.com/Publication/vwLUAssets/ey-mifid2-ir-survey/$FILE/ey-mifid2-ir-survey.pdf.

Feng, M., & McVay, S. (2010). Analysts' incentives to overweight management guidance when revising their short-term earnings forecasts. The Accounting Review, 85(5), 1617-1646.

Financial Times (2019). Mifid II drives US investment industry frantic. Retrieved February 1, 2019 from https://www.ft.com/content/3e58084c-77b9-11e7-a3e8-60495fe6ca71.

Francis, J. & Philbrick, D. (1993). Analysts' decisions as products of a multi‐task environment, Journal of Accounting Research 31, 216−230.

Francis, J., Schipper, K. & Vincent, L. (2002). Expanded disclosures and the increased usefulness of earnings announcements, The Accounting Review 77, 515–546.

Francis, J., & Soffer, L. (1997). The relative informativeness of analysts' stock recommendations and earnings forecast revisions. Journal of Accounting Research, 35(2), 193-211.

Guo, Y. & Mota, L. (2019). Unbundling and Analyst Research Production: The Impact of MiFID II. Available at SSRN: https://ssrn.com/abstract=3399506

Hainmueller, J. (2012). Entropy balancing for causal effects: A multivariate reweighting method to produce balanced samples in observational studies. Political Analysis, 20(1), 25-46.

Hayes, R. M. (1998). The impact of trading commission incentives on analysts' stock coverage decisions and earnings forecasts. Journal of Accounting Research, 36(2), 299-320.

Hong, H., & Kacperczyk, M. (2010). Competition and bias. *The Quarterly Journal of Economics*, *125*(4), 1683-1725.

Hopfensperger, C. (2018) MiFID II and Its Effects on US Advisers. Retrieved May. 8, 2019 from https://www.hardincompliance.com/wp-content/uploads/2018/01/Mifid-II-and-its-Effects-on-US-Advisers-1-5-2018.pdf.

Ivković, Z., & Jegadeesh, N. (2004). The timing and value of forecast and recommendation revisions. *Journal of Financial Economics*, *73*(3), 433-463.

Jackson, A. R. (2005). Trade generation, reputation, and sell‐side analysts. The Journal of Finance, 60(2), 673-717.

Johnsen, D. B. (2009). Myths about mutual fund fees: Economic insights on Jones v. Harris. J. Corp. L., 35, 561.

Ke, B., & Yu, Y. (2006). The effect of issuing biased earnings forecasts on analysts' access to management and survival. Journal of Accounting Research, 44(5), 965-999.

Keung, E. C. (2010). Do supplementary sales forecasts increase the credibility of financial analysts' earnings forecasts?. *The Accounting Review*, *85*(6), 2047-2074.

Lehavy, R., Li, F., & Merkley, K. (2011). The effect of annual report readability on analyst following and the properties of their earnings forecasts. *The Accounting Review*, *86*(3), 1087-1115.

Mayew, W.J., 2008. Evidence of management discrimination among analysts during earnings conference calls, Journal of Accounting Research 46(3), 627–659.

Merkley, K., Michaely, R., & Pacelli, J. (2017). Does the scope of the sell‐side analyst industry matter? An examination of bias, accuracy, and information content of analyst reports. *The Journal of Finance*, *72*(3), 1285-1334.

Peel Hunt (2018). The new world of MiFID II. Retrieved May. 8, 2019 from https://s3-eu-west-1.amazonaws.com/peel-hunt-website/QCAPeel+Hunt+Mid+and+Small Cap+Investor+Survey+2018.pdf.

PricewaterhouseCoopers, L. L. P. (2016). The future of Research: Impact of MiFID II on research for investment firms. Retrieved February 25, 2019 from https://www.pwc.com/gx/en/advisory-services/publications/assets/the-future-of-research-mifid-ii.pdf.

WSJ (2018). The Dangerous Rise of Sponsored Stock Research. Retrieved November 30, 2018 from https://www.wsj.com/articles/the-dangerous-rise-of-sponsored-stock-research-1543400111.

Appendix A – Variable Definitions

Firm/Country Level Variables	
Coverage	Natural log of 1+ the number of sell-side analysts (*Analyst*) who issue a quarterly forecast for a given firm for the given quarter.
RetVol	Standard Deviation of daily returns over a quarter for a given firm.
ROA	Quarterly net income before extraordinary items scaled by quarterly total assets at a firm.
EarnVol	Rolling standard deviation of ROA (defined above) in the last five quarters, with a minimum of three ROA observations.
Loss	Indicator that equals 1 if quarterly ROA is negative, and 0 otherwise.
Intan	Quarterly intangibles scaled by quarterly total assets at a firm.
Size	Natural log of quarterly total assets, in US dollars at a firm.
Lev	Total quarterly liabilities divided by total quarterly assets at a firm.
FirmAge	The fiscal year of the firm observation minus the first year in which the firm shows up in *CRSP* (U.S. firms) or *Compustat Global* (European firms).
MtB	Total market value of equity at quarter end divided by total quarterly book value of equity for a firm.
AvgAnalystFirms	Number of firms that an analyst issues quarterly forecasts for in a given quarter, averaged across all analysts in the firm.
AvgAnalystForecasts	Number of forecasts that an analyst issues in a given quarter, averaged across all analysts in the firm.
AnalyInfo	Informativeness of analysts, calculated by summing the absolute market-adjusted returns for all analyst EPS forecast revision dates in a given quarter and dividing by the sum of all absolute market-adjusted returns for all trading days in the quarter.
EPSOnlyInfo	Informativeness of analyst forecasts that are not supplemented by a stock price recommendation, calculated by summing the absolute market-adjusted returns for all analyst no-recommendation EPS forecast revision dates in a given quarter and dividing by the sum of all absolute market-adjusted returns for all trading days in the quarter.
RecommendInfo	Informativeness of analyst forecasts supplemented by a stock price recommendation, calculated by summing the absolute market-adjusted returns for all recommendation-included EPS forecast revision dates in a given quarter and dividing by the sum of all absolute market-adjusted returns for all trading days in the quarter.
AnalystForecasts	Total number of quarterly forecasts made by analysts for a firm
EAInfo	Market-adjusted absolute cumulative abnormal returns for the three-day window around a firm's quarterly earnings announcement date
BidAsk	Quarterly median of daily bid-ask spread, where bid-ask spread is calculated as |bid-ask|/((bid+ask)/2)
lnGDPpercap	Natural log of GDP per capita
GDPgrowth	Percentage change in GDP, measured as current year GDP minus the previous year GDP, scaled by previous year GDP
Forecast/Analyst/Brokerage Level Variables	
SaleForecast	Indicator that equals 1 if the forecast includes a supplementary sales forecast, and 0 if otherwise
NumOtherVars	For a given analyst report, the total number of variable forecasts (other than EPS) that is included

Recommend	Indicator that equals 1 if the forecast includes a stock recommendation, and 0 otherwise
RecChange	Indicator that equals 1 if the stock recommendation has changed since the previous recommendation made for the same firm by the same analyst, and 0 otherwise
Nonholdrec	Indicator that equals 1 if the stock recommendation is not a "hold", and 0 otherwise
Extremerec	Indicator that equals 1 if the recommendation is either a "strong sell" or a "strong buy", and 0 otherwise
OptimRec	Indicator that equals 1 if the recommendation is either a "buy" or "strong buy", and 0 otherwise
PessimRec	Indicator that equals 1 if the recommendation is either a "underperform/sell" or "strong sell", and 0 otherwise
StrongBuy	Indicator that equals 1 if the recommendation is a "strong buy", and 0 otherwise
OptimRev	Indicator that equals 1 if the EPS revision is greater than the previous EPS revision made for the same firm by the same analyst, and 0 otherwise
PessimRev	Indicator that equals 1 if the EPS revision is less than the previous EPS revision made for the same firm by the same analyst, and 0 otherwise
RevisionResponse	Number of days between the prior quarter-end earnings announcement and the first subsequent quarterly EPS forecast made for the firm by the same analyst
RevisionLag	Number of days between the EPS forecast and the previous EPS forecast made for the same firm by the same analyst for the same quarter-end
Inaccuracy	The difference between the estimated EPS and the actual EPS for the quarter-end, divided by the stock price two days prior to the EPS forecast
CAR	Three day market-adjusted cumulative abnormal daily return around the analyst forecast
lnBroSize	Natural log of one plus the number of active analysts at a brokerage in a quarter (*BroSize*)
GExp	Number of years for which the analyst has been active on the sell-side, computed by taking the difference between the given fiscal year and the first year in which the analyst makes a forecast for any firm on I/B/E/S
FExp	Number of years for which the analyst has been covering the given firm, computed by taking the difference between the given fiscal year and the first year in which the analyst makes a forecast for that firm on I/B/E/S
FHor	Difference between the given forecast revision date and the subsequent quarterly earnings announcement date
lnAnaInd	Natural log of one plus the number of 2-digit SIC industries covered by a given analyst during a given quarter (*AnaInd*)
lnAnalystFirms	Natural log of one plus the number of total firms that an analyst issues a quarterly EPS forecast for in a given quarter (*AnalystFirms*)

Figure 1 – Graphical Display of Residual Analyst Following

This figure plots the average residuals of regressing analyst coverage on several firm-level characteristics including firm size, return volatility, earnings volatility, a loss indicator, intangibles, leverage, profitability (ROA), firm age, market to book ratio and firm and year fixed effects. Average residuals with 95% confidence intervals are displayed by group over time. The variables are defined in detail in Appendix A.

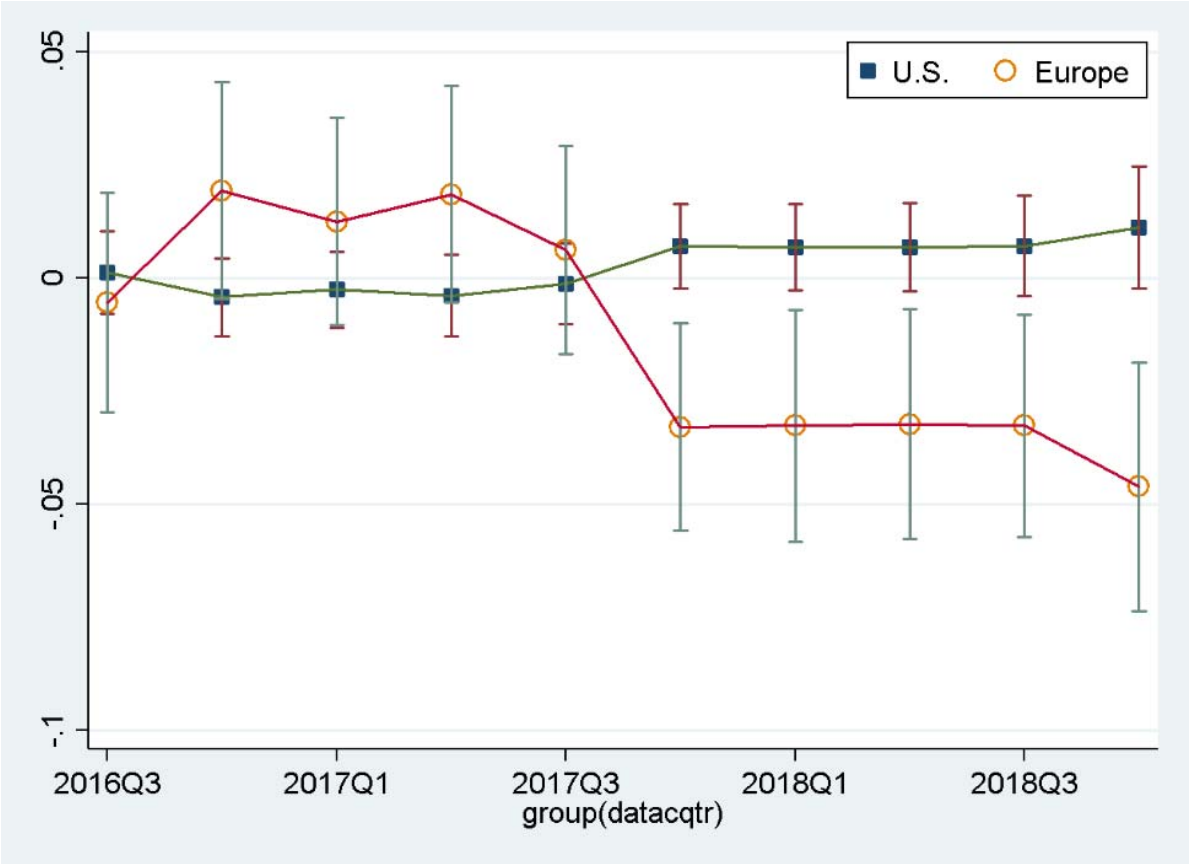

Table 1 – List of Countries and Mean Analyst Following

This table presents the number of observations and the average quarterly analyst coverage by country for our sample.

Country	Num Obs	Avg # Analysts
Austria	421	0.89
Belgium	176	1.09
Bulgaria	16	0.06
Cyprus	41	1.71
Czech Republic	55	0.95
Germany	2526	1.60
Denmark	585	3.52
Spain	581	1.26
Estonia	32	0.38
Finland	1238	3.01
France	338	0.87
Greece	197	0.76
Croatia	32	0.09
Hungary	48	1.19
Ireland	16	2.19
Italy	645	0.78
Lithuania	32	0.16
Luxembourg	67	1.21
Malta	27	2.19
Netherlands	229	1.39
Poland	627	0.46
Portugal	80	2.66
Romania	94	0.32
Slovenia	16	0.06
Sweden	2393	2.27
Europe	10512	1.78
United States (control)	48924	7.13

Table 2 – Descriptive Statistics

This table presents the descriptive statistics for European firms (Panel A) and US firms (Panel B) in our sample. All variables are defined in Appendix A.

Panel A - EU firms

	N	Mean	Median	Std Dev
Controls				
RetVol	10512	0.02	0.02	0.01
EarnVol	10512	0.01	0.01	0.02
Loss	10512	0.16	0.00	0.37
Intan	10512	22.28	15.16	21.99
Size	10512	7.20	7.22	2.27
Lev	10512	0.58	0.58	0.20
ROA	10512	0.01	0.01	0.03
FirmAge	10512	16.98	18.00	6.87
MtB	10512	3.10	2.07	3.19
lnGDPpercap	10512	10.63	10.73	0.40
GDPgrowth	10512	2.22	2.14	1.32
AnalystForecasts	6081	10.79	9.00	11.48
BroSize	24989	52.74	34.00	54.78
FExp	24989	9.60	11.00	3.81
GExp	24989	5.73	6.00	4.20
FHor	24989	51.22	49.00	39.14
AnaInd	24989	3.24	2.00	3.33
AnalystFirms	24989	7.20	6.00	7.92
Dep. Variables				
Analyst	10512	1.78	1.00	2.40
AvgAnalystFirms	6476	7.21	6.00	7.24
AvgAnalystForecasts	6476	9.98	8.50	10.24
AnalyInfo	10512	0.03	0.00	0.06
EPSOnlyInfo	10512	0.02	0.00	0.05
RecommendInfo	10512	0.00	0.00	0.01
EAInfo	6373	0.02	0.02	0.02
BidAsk	10459	0.02	0.02	0.01
SaleForecast	24989	0.72	1.00	0.45
NumOtherVars	24989	3.68	4.00	2.44
Recommend	24989	0.11	0.00	0.31
RecChange	24989	0.10	0.00	0.30
Nonholdrec	24989	0.07	0.00	0.25
Extremerec	24989	0.02	0.00	0.14
OptimRec	24989	0.05	0.00	0.21
PessimRec	24989	0.02	0.00	0.14
StrongBuy	24989	0.01	0.00	0.12
OptimRev	22556	0.50	0.00	0.50
PessimRev	22556	0.48	0.00	0.50
RevisionResponse	9335	79.09	83.00	9.90
RevisionLag	22556	85.36	73.00	78.52
Inaccuracy	23915	43.11	17.38	67.46
CAR	24989	0.39	0.38	0.01

Panel B - US firms

	N	Mean	Median	Std Dev
Controls				
RetVol	48924	0.03	0.02	0.02
EarnVol	48924	0.02	0.01	0.04
Loss	48924	0.33	0.00	0.47
Intan	48924	17.14	6.44	21.49
Size	48924	7.26	7.30	2.11
Lev	48924	0.58	0.58	0.28
ROA	48924	-0.01	0.00	0.06
FirmAge	48924	22.31	19.00	16.90
MtB	48924	2.82	1.81	3.34
lnGDPpercap	48924	10.86	10.87	0.02
GDPgrowth	48924	2.28	2.27	0.52
AnalystForecasts	44349	20.77	19.00	12.05
BroSize	471706	54.56	42.00	45.50
FExp	471706	9.16	7.00	8.61
GExp	471706	10.56	9.00	7.67
FHor	471706	66.82	83.00	33.22
AnaInd	471706	3.10	3.00	2.24
AnalystFirms	471706	15.24	15.00	7.50
Dep. Variables				
Analyst	48924	7.13	5.00	6.94
AvgAnalystFirms	44462	14.73	14.50	5.24
AvgAnalystForecasts	44462	19.79	18.67	8.26
AnalyInfo	48919	0.11	0.08	0.13
EPSOnlyInfo	48919	0.10	0.07	0.11
RecommendInfo	48919	0.01	0.00	0.02
EAInfo	46267	0.03	0.02	0.01
BidAsk	48924	0.00	0.00	0.01
SaleForecast	471706	0.56	1.00	0.50
NumOtherVars	471706	3.38	3.00	3.09
Recommend	471706	0.07	0.00	0.26
RecChange	471706	0.06	0.00	0.24
Nonholdrec	471706	0.04	0.00	0.20
Extremerec	471706	0.01	0.00	0.12
OptimRec	471706	0.04	0.00	0.19
PessimRec	471706	0.00	0.00	0.07
StrongBuy	471706	0.01	0.00	0.11
OptimRev	447408	0.52	1.00	0.50
PessimRev	447408	0.45	0.00	0.50
RevisionResponse	146502	79.71	84.00	9.80
RevisionLag	447408	71.07	70.00	52.72
Inaccuracy	455899	42.94	15.21	71.83
CAR	467652	0.39	0.39	0.02

Table 3 – Analyst Coverage

This table presents the effects of MiFID II on analyst coverage at the firm-quarter level. Our main variable of interest is I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for observations in 2018, and zero otherwise. Panel A presents the results for different model specifications. Panel B presents cross-sectional effects of MiFID II on coverage based on firm size, prior coverage, prior age, prior stock return volatility and prior forecast accuracy. Besides size, splits are based on median values in the year prior to MiFID II (2017). For size, splits are based on 2017 terciles (Large, Medium and Small). All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Panel A – Effect of MiFID II on Analyst Coverage

Specification	Coverage *No controls*	Coverage *Country, Industry, Quarter Fixed Effects*	Coverage *Firm, Quarter Fixed Effects*	Coverage *Must have nonzero analyst following in pre-MiFID period*
I(Treat)*I(Post)	-0.046***	-0.050***	-0.057***	-0.112***
	(-3.56)	(-3.70)	(-4.53)	(-5.47)
Retvol		-0.095	-0.166	0.573**
		(-0.19)	(-0.67)	(2.03)
Earnvol		-0.366**	-0.525***	-0.429***
		(-2.31)	(-5.02)	(-3.18)
Loss		0.003	-0.026***	-0.018***
		(0.19)	(-4.57)	(-3.10)
Intan		0.002***	-0.000	-0.002***
		(3.83)	(-0.83)	(-3.16)
Size		0.335***	0.320***	0.316***
		(57.19)	(21.49)	(19.99)
Lev		-0.217***	0.063**	0.104***
		(-5.33)	(2.04)	(3.07)
ROA		-0.885***	-0.514***	-0.488***
		(-6.73)	(-7.78)	(-6.20)
Firmage		-0.005***	-0.022**	-0.008
		(-8.22)	(-2.38)	(-0.76)
MtB		0.044***	0.005***	0.005***
		(18.55)	(4.85)	(4.14)
lngdppc		-0.131	0.229	-0.682
		(-0.22)	(0.42)	(-0.99)
gdpgrowth		-0.013**	-0.013**	-0.003
		(-2.13)	(-2.12)	(-0.52)
N	59430	59158	59430	39165
R^2	0.90	0.61	0.90	0.88
Firm FE	N	N	Y	Y
Country FE	N	Y	N	N
Industry FE	N	Y	N	N
Year-Qtr FE	N	Y	Y	Y

Panel B – Cross Sectional Tests of Analyst Coverage following MiFID II

	Coverage	Coverage	Coverage	Coverage	Coverage
I(Treat)*I(Post)	0.026	-0.045***	-0.030	-0.103***	0.019
	(1.11)	(-3.01)	(-1.51)	(-6.89)	(0.88)
I(Treat)*I(Post)*Large	-0.113***				
	(-3.59)				
I(Treat)*I(Post)*Medium	-0.135***				
	(-4.35)				
I(Treat)*I(Post)*High_Cov		-0.063*			
		(-1.86)			
I(Treat)*I(Post)*High_Age			-0.047*		
			(-1.83)		
I(Treat)*I(Post)*High_Vol				0.115***	
				(4.32)	
I(Treat)*I(Post)*High_Acc					-0.130***
					(-4.99)
Size	0.320***	0.319***	0.320***	0.318***	0.316***
	(21.50)	(21.42)	(21.39)	(21.44)	(21.35)
Lev	0.063**	0.062**	0.064**	0.069**	0.069**
	(2.02)	(2.00)	(2.05)	(2.21)	(2.22)
ROA	-0.512***	-0.514***	-0.515***	-0.508***	-0.505***
	(-7.75)	(-7.78)	(-7.78)	(-7.70)	(-7.68)
Firmage	-0.021**	-0.021**	-0.021**	-0.020**	-0.019**
	(-2.25)	(-2.23)	(-2.21)	(-2.10)	(-2.01)
MtB	0.005***	0.005***	0.005***	0.005***	0.005***
	(4.80)	(4.88)	(4.88)	(4.91)	(4.91)
lnGDPpercap	0.177	0.192	0.163	0.202	0.230
	(0.33)	(0.35)	(0.30)	(0.38)	(0.42)
GDPgrowth	-0.011*	-0.013**	-0.012**	-0.012**	-0.013**
	(-1.87)	(-2.11)	(-2.06)	(-2.00)	(-2.12)
N	59430	59406	59406	59406	59406
R^2	0.90	0.90	0.90	0.90	0.90
Firm FE	Y	Y	Y	Y	Y
Year-Qtr FE	Y	Y	Y	Y	Y

Table 4 –Focus Of Remaining Analysts After MiFID II

This table presents the effects of MiFID II on analyst focus at the firm-quarter level. We measure analyst focus using the average number of firms a given analyst covers in a given quarter (*AvgAnalystFirm*) and the average number of forecasts a given analyst issues in a given quarter (*AvgAnalystForecasts*). Our main variable of interest is I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for year 2018, and zero otherwise. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

	AvgAnalystFirms	AvgAnalystForecasts
I(Treat)*I(Post)	-0.059***	-0.059***
	(-3.81)	(-2.82)
Retvol	0.241	0.545**
	(1.36)	(2.49)
Earnvol	0.012	0.004
	(0.19)	(0.05)
Loss	0.008*	0.009*
	(1.71)	(1.68)
Intan	0.000	-0.000
	(0.42)	(-0.46)
Size	0.030***	0.064***
	(3.31)	(5.38)
Lev	-0.016	-0.034
	(-0.78)	(-1.31)
ROA	-0.056	-0.114*
	(-1.06)	(-1.81)
Firmage	-0.018*	-0.029**
	(-1.73)	(-2.19)
MtB	-0.000	-0.000
	(-0.62)	(-0.49)
lnGDPpercap	1.853**	2.035**
	(2.48)	(2.13)
GDPgrowth	-0.024***	-0.031***
	(-4.74)	(-4.53)
N	50939	50939
R^2	0.76	0.76
Firm FE	Y	Y
Year-Qtr FE	Y	Y

Table 5 – Analyst Effort Results

This table presents the effects of MiFID II on analyst effort at the forecast level. In Panel A, we examine whether MiFID II affects the likelihood of a forecast to contain sales forecast (*SaleForecast*), the number of additional variables forecasted other than earnings (*NumOtherVars*) and forecast inaccuracy (*Inaccuracy*). In Panel B, we examine whether MiFID II affects the likelihood of a forecast to include a recommendation (*Recommend)*, a recommendation change (*RecChange)*, a non-hold recommendation (*NonHoldRec)* or an extreme recommendation (*ExtremeRec*). In panel C, we examine whether MiFID II affects the forecast timeliness after an earnings announcement (*RevisionResponse*) and timeliness of a new revision (*RevisionLag*). Our main variable of interest is I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for year 2018, and zero otherwise. We include firm, analyst, brokerage and year-quarter fixed effects in all columns. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Panel A – Other Variables Forecasted

	SaleForecast	NumOtherVars	Inaccuracy
I(Treat)*I(Post)	0.056***	0.088***	-0.028**
	(5.97)	(6.50)	(-2.39)
Retvol	-0.466***	-0.629***	7.164***
	(-4.53)	(-4.05)	(30.28)
Earnvol	0.052	-0.003	1.453***
	(1.58)	(-0.07)	(15.40)
Loss	-0.004	-0.004	0.105***
	(-1.62)	(-1.04)	(15.39)
Intan	0.000**	0.001***	0.000
	(2.26)	(3.02)	(1.33)
Size	-0.013***	-0.030***	-0.007
	(-2.69)	(-3.84)	(-0.89)
Lev	0.006	-0.018	0.440***
	(0.53)	(-1.19)	(22.02)
ROA	0.095***	0.053	-0.124
	(3.30)	(1.23)	(-1.59)
Firmage	0.003	-0.001	0.022***
	(0.50)	(-0.15)	(3.56)
MtB	-0.000	0.000	-0.013***
	(-0.35)	(0.55)	(-18.63)
lnBrosize	-0.001	-0.001	-0.000
	(-0.51)	(-0.66)	(-0.19)
FExp	0.002	0.005*	0.004**
	(1.19)	(1.68)	(2.26)
GExp	-0.017	-0.001	-0.005
	(-1.06)	(-0.06)	(-0.73)
FHor	0.001***	0.002***	0.001***
	(18.73)	(14.40)	(26.28)
lnAnaInd	0.002	0.002	0.009*
	(0.44)	(0.22)	(1.77)
lnAnalystFirms	-0.009**	-0.019**	0.009*
	(-2.06)	(-2.42)	(1.75)
lnGDPpercap	1.034***	1.885***	-0.982**
	(3.28)	(4.50)	(-2.53)
GDPgrowth	-0.001	-0.005	-0.003
	(-0.27)	(-1.49)	(-0.92)
N	496144	496144	479274
R^2	0.49	0.59	0.57
Fixed Effects	F, A, B, Y-Q	F, A, B, Y-Q	F, A, B, Y-Q	F, A, B, Y-Q

Panel B – Recommendations

	Recommend	RecChange	NonHoldRec	ExtremeRec
I(Treat)*I(Post)	0.024***	0.017***	0.015***	0.006**
	(4.13)	(3.04)	(3.62)	(2.47)
Retvol	1.072***	1.028***	0.339***	0.074**
	(14.45)	(14.74)	(6.28)	(2.40)
Earnvol	0.096***	0.080***	0.098***	0.042***
	(4.26)	(3.67)	(5.27)	(3.86)
Loss	0.002	0.001	0.000	-0.000
	(1.08)	(0.91)	(0.31)	(-0.11)
Intan	0.000**	0.000**	0.000***	0.000
	(2.24)	(2.06)	(3.07)	(0.94)
Size	-0.014***	-0.012***	-0.014***	-0.005***
	(-5.47)	(-5.00)	(-7.31)	(-4.35)
Lev	-0.041***	-0.038***	-0.030***	-0.009***
	(-6.92)	(-7.02)	(-6.43)	(-3.22)
ROA	0.019	0.018	0.050***	0.014*
	(1.10)	(1.12)	(3.73)	(1.85)
Firmage	-0.015***	-0.012***	-0.012***	-0.005***
	(-4.88)	(-4.38)	(-5.88)	(-4.44)
MtB	-0.000	-0.000	0.000	0.000**
	(-1.10)	(-1.05)	(1.09)	(2.15)
lnBrosize	0.002*	0.002**	0.001**	0.000
	(1.85)	(2.20)	(2.08)	(0.01)
FExp	-0.002**	-0.001	-0.001**	-0.001**
	(-2.24)	(-1.48)	(-2.22)	(-2.49)
GExp	0.002	0.003	0.002	0.002
	(0.26)	(0.59)	(0.45)	(0.88)
FHor	-0.001***	-0.001***	-0.001***	-0.000***
	(-34.64)	(-34.56)	(-32.40)	(-21.54)
lnAnaInd	0.004	0.002	0.005**	0.001
	(1.36)	(0.64)	(2.33)	(0.52)
lnAnalystFirms	-0.038***	-0.032***	-0.028***	-0.010***
	(-11.03)	(-10.34)	(-11.65)	(-7.29)
lnGDPpercap	-1.044***	-0.983***	-0.516***	-0.131**
	(-5.59)	(-5.54)	(-4.13)	(-2.05)
GDPgrowth	0.004**	0.003*	0.000	-0.001
	(2.06)	(1.70)	(0.07)	(-0.81)
N	496144	496144	496144	496144
R^2	0.10	0.09	0.08	0.08
Fixed Effects	F, A, B, Y-Q	F, A, B, Y-Q	F, A, B, Y-Q	F, A, B, Y-Q

Panel C – Revision Lag

	RevisionResponse	RevisionLag
I(Treat)*I(Post)	0.024***	0.046**
	(5.22)	(2.13)
Retvol	-0.654***	-2.891***
	(-11.65)	(-13.48)
Earnvol	0.044	-0.214***
	(1.64)	(-3.21)
Loss	-0.008***	-0.007
	(-6.13)	(-1.64)
Intan	-0.001***	-0.001**
	(-8.39)	(-2.10)
Size	0.018***	-0.086***
	(8.84)	(-10.60)
Lev	0.016***	0.005
	(2.91)	(0.25)
lag_ROA	0.033*	0.047
	(1.93)	(0.93)
Firmage	-0.091***	0.043***
	(-19.46)	(4.86)
MtB	-0.000	-0.001
	(-0.51)	(-0.93)
FExp	0.000*	0.002
	(1.86)	(0.71)
GExp	0.008***	-0.023*
	(3.35)	(-1.90)
lnAnaInd	-0.000	0.007
	(-0.28)	(0.83)
lnBrosize	0.000	-0.001
	(0.50)	(-0.35)
lnAnalystFirms	0.004**	-0.008
	(2.48)	(-0.93)
lnGDPpercap	-3.329***	0.420
	(-7.03)	(0.79)
GDPgrowth	0.016***	0.009
	(6.38)	(1.42)
N	132215	450863
R^2	0.68	0.20
Fixed Effects	F, A, B, Y-Q	F, A, B, Y-Q

Table 6 – Forecast Level Analyst Optimism

This table presents the effects of MiFID II on analyst optimism at the forecast level. In Panel A, we examine whether MiFID2 affects the likelihood of an analyst issuing an optimistic recommendation (*OptimRec*), a pessimistic recommendation (*PessimRec*) and a strong buy recommendation (*StrongBuy*). In Panel B, we examine the effects of MiFID II on earnings forecast revision. We split earnings forecast revision into optimistic EPS revision (*OptimEPSRev)* and pessimistic EPS revision (*PessimEPSRev*). Our main variable of interest is I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for year 2018, and zero otherwise. All variables are defined in the Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Panel A – Recommendation Optimism

	OptimRec	PessimRec	StrongBuy
I(Treat)*I(Post)	0.011***	0.004	0.004**
	(3.05)	(1.52)	(2.02)
Retvol	0.153***	0.186***	0.038
	(3.06)	(8.28)	(1.34)
Earnvol	0.099***	-0.001	0.041***
	(5.69)	(-0.21)	(3.88)
Loss	0.000	0.000	-0.000
	(0.14)	(0.45)	(-0.24)
Intan	0.000***	0.000	0.000
	(2.65)	(1.62)	(0.90)
Size	-0.014***	-0.000	-0.005***
	(-7.51)	(-0.28)	(-4.53)
Lev	-0.027***	-0.003*	-0.009***
	(-6.15)	(-1.70)	(-3.41)
ROA	0.055***	-0.005	0.018**
	(4.39)	(-0.85)	(2.36)
Firmage	-0.012***	0.000	-0.005***
	(-6.63)	(0.38)	(-4.55)
MtB	0.000*	-0.000**	0.000**
	(1.86)	(-2.25)	(2.36)
lnBrosize	0.001**	0.000	0.000
	(1.98)	(0.85)	(0.25)
FExp	-0.001**	-0.000	-0.001**
	(-2.09)	(-0.75)	(-2.31)
GExp	0.003	-0.001**	0.002
	(0.75)	(-2.39)	(0.99)
FHor	-0.001***	-0.000***	-0.000***
	(-30.94)	(-15.37)	(-21.29)
lnAnaInd	0.005***	-0.000	0.001
	(2.79)	(-0.43)	(0.61)
lnAnalystFirms	-0.026***	-0.002***	-0.010***
	(-11.55)	(-2.96)	(-7.34)
lnGDPpercap	-0.393***	-0.123**	-0.111*
	(-3.52)	(-2.04)	(-1.92)
GDPgrowth	0.001	-0.001	-0.000
	(0.58)	(-0.83)	(-0.72)
N	496144	496144	496144
R^2	0.08	0.05	0.08
Fixed Effects	F, A, B, Y-Q	F, A, B, Y-Q	F, A, B, Y-Q

Panel B – EPS Revision Optimism

	OptimEPSRev	PessimEPSRev
I(Treat)*I(Post)	-0.040***	0.030***
	(-4.46)	(3.37)
Retvol	-1.154***	1.361***
	(-9.05)	(10.65)
Earnvol	0.629***	-0.553***
	(14.09)	(-12.35)
Loss	-0.081***	0.081***
	(-26.30)	(26.50)
Intan	0.000*	-0.000
	(1.69)	(-1.22)
Size	-0.024***	0.032***
	(-4.86)	(6.43)
Lev	0.159***	-0.160***
	(13.81)	(-14.12)
ROA	1.159***	-1.141***
	(23.90)	(-23.57)
Firmage	-0.013**	0.016***
	(-2.20)	(2.73)
MtB	0.005***	-0.005***
	(12.55)	(-12.30)
lnBrosize	-0.001	0.001
	(-0.70)	(0.50)
FExp	-0.002*	0.003**
	(-1.75)	(2.24)
GExp	-0.035***	0.033***
	(-3.68)	(3.77)
FHor	0.002***	-0.002***
	(41.92)	(-46.08)
lnAnaInd	0.005	-0.005
	(1.15)	(-1.20)
lnAnalystFirms	-0.013***	0.012***
	(-2.82)	(2.70)
lnGDPpercap	-1.158***	1.140***
	(-3.58)	(3.52)
GDPgrowth	-0.010***	0.010***
	(-3.96)	(4.14)
N	469541	469541
R^2	0.10	0.10
Fixed Effects	F, A, B, Y-Q	F, A, B, Y-Q

Table 7 – Market Reaction, Forecast Level

This table presents the effects of MiFID II on market reaction to individual forecasts. Specifically, we estimate OLS regressions of the 3-day cumulative market reaction to an analyst forecast post-MiFID II. Our main variable of interest is the average treatment effect captured by the coefficient of I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for year 2018, and zero otherwise. In Column 2, we examine whether market reaction varies with the amount of information forecasted by the analyst, captured by an indicator for a forecast with above-median number of non-EPS items forecasted (*ManyVars*). All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

	CAR	CAR
I(Treat)*I(Post)	0.001***	-0.000
	(4.29)	(-0.07)
ManyVars		0.000***
		(6.71)
I(Treat)*I(Post)*ManyVars		0.001***
		(2.86)
Loss	0.000***	0.000***
	(4.39)	(4.39)
Intan	0.000***	0.000***
	(5.31)	(5.26)
Size	-0.000**	-0.000**
	(-2.47)	(-2.47)
Lev	0.000	0.000
	(0.93)	(0.91)
ROA	-0.006***	-0.006***
	(-5.99)	(-5.98)
Firmage	0.000	0.000
	(0.74)	(0.71)
MtB	-0.000***	-0.000***
	(-8.15)	(-8.17)
lnBrosize	0.000	-0.000
	(0.14)	(-0.03)
GExp	-0.000	-0.000
	(-0.69)	(-0.74)
FHor	0.000***	0.000***
	(70.22)	(69.74)
lnAnaInd	-0.000*	-0.000*
	(-1.92)	(-1.91)
lnAnalystFirms	-0.000	-0.000
	(-0.29)	(-0.25)
lnGDPpercap	0.055***	0.055***
	(6.06)	(6.09)
GDPgrowth	-0.000***	-0.000***
	(-2.96)	(-2.86)
N	492093	492093
R^2	0.47	0.47
Fixed Effects	F, A, B, Y-Q	F, A, B, Y-Q

Table 8 –Information Environment at the Firm Level

This table presents the effects of MiFID II on aggregate analyst informativeness at the firm-quarter level. Specifically, we estimate OLS regressions of aggregate analyst informativeness (*AnalyInfo*), aggregate EPS-only forecast informativeness (*EPSOnlyInfo*), and aggregate recommendation-included forecast informativeness (*RecommendInfo*) post-MiFID II. Our main variable of interest is I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for year 2018, and zero otherwise. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Panel A – Analyst Informativeness

	AnalyInfo	EPSOnlyInfo	RecommendInfo
I(Treat)*I(Post)	-0.006***	-0.007***	0.002***
	(-2.88)	(-3.93)	(3.19)
lnanalystforecasts	0.006***	0.006***	0.000
	(8.01)	(9.46)	(1.23)
Retvol	0.706***	0.501***	0.165***
	(16.52)	(13.89)	(13.17)
Earnvol	-0.053***	-0.053***	0.003
	(-4.24)	(-4.89)	(0.74)
Loss	-0.002	-0.002	0.001
	(-1.61)	(-1.52)	(1.51)
Intan	0.000	0.000	0.000
	(0.80)	(0.63)	(1.25)
Size	0.024***	0.022***	0.002***
	(12.24)	(13.06)	(4.27)
Lev	-0.008*	-0.003	-0.002**
	(-1.82)	(-0.79)	(-2.21)
ROA	-0.029**	-0.023**	-0.001
	(-2.17)	(-2.22)	(-0.46)
Firmage	-0.001	-0.002	0.001*
	(-0.40)	(-0.96)	(1.77)
MtB	0.000	0.000*	0.000
	(1.62)	(1.76)	(1.50)
lnGDPpercap	-0.008	-0.005	-0.021
	(-0.12)	(-0.08)	(-1.17)
GDPgrowth	-0.002***	-0.002***	0.000
	(-2.63)	(-2.99)	(0.58)
N	50280	50280	50280
R^2	0.70	0.69	0.17
Firm FE	Y	Y	Y
Year-Qtr FE	Y	Y	Y

Panel B – Earnings Announcement Informativeness and Bid-Ask Spread

	EAINFO	BIDASK
I(Treat)*I(Post)	0.001***	0.002***
	(2.77)	(8.60)
Retvol	0.118***	0.067***
	(13.76)	(16.84)
lnanalyst	0.001**	-0.001***
	(2.49)	(-6.62)
Earnvol	0.009***	0.000
	(3.35)	(0.03)
Loss	0.000	0.000***
	(0.47)	(3.24)
Intan	0.000	0.000***
	(0.21)	(4.82)
Size	0.001**	-0.002***
	(2.50)	(-10.66)
Lev	0.004***	0.002***
	(4.95)	(4.17)
ROA	-0.003	-0.000
	(-1.15)	(-0.39)
Firmage	-0.001***	0.000
	(-3.08)	(0.85)
MtB	-0.000**	-0.000***
	(-2.55)	(-5.79)
lnGDPpercap	0.021	-0.001
	(1.22)	(-0.10)
GDPgrowth	-0.000*	-0.001***
	(-1.69)	(-6.57)
N	52587	59376
R^2	0.39	0.89
Firm FE	Y	Y
Year-Qtr FE	Y	Y

Table 9 – Robustness Tests for Analyst Coverage

This table presents the effects of MiFID II on analyst coverage at the firm-quarter level. Our main variable of interest is I(Treat)*I(Post). I(Treat) is an indicator variable equal to one for European firms, and zero otherwise. I(Post) is an indicator variable equal to one for year 2018, and zero otherwise. Column 1 displays the results using a control sample matched on firm characteristics pre-MiFID II using propensity score matching. Column 2 displays the estimations using entropy balancing weighting. All variables are defined in Appendix A. Standard errors are clustered by firm. ***, **, * indicates significance at the 0.01, 0.05, 0.10 level, respectively.

Dep. Var Test	Coverage Propensity Score Matching	Coverage Entropy Balancing
I(Treat)*I(Post)	-0.071***	-0.053***
	(-5.01)	(-3.72)
Retvol	0.994**	0.858**
	(2.56)	(2.52)
Earnvol	-0.817***	0.456***
	(-3.06)	(2.80)
Loss	0.002	0.030***
	(0.26)	(2.84)
Intan	-0.000	0.002***
	(-0.23)	(9.43)
Size	0.302***	0.309***
	(15.70)	(141.52)
Lev	0.012	-0.238***
	(0.26)	(-13.72)
ROA	0.095	0.606***
	(0.71)	(4.91)
Firmage	-0.009	-0.006***
	(-0.68)	(-21.59)
MtB	0.004**	0.035***
	(2.40)	(31.78)
lnGDPpercap	0.212	0.174
	(0.37)	(0.43)
GDPgrowth	-0.014**	-0.014***
	(-2.06)	(-2.74)
N	33775	59402
R^2	0.90	0.65
Firm FE	Y	Y
Year-Qtr FE	Y	Y